OpenAnalysisService: Offering Program Analysis as Service

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Problem Statement: A variety of static and dynamic program analysis tools are needed to help improve the performance and correctness of computational and data-intensive (CDI) applications running across a range of different hardware platforms. Example tools include these generating call graphs or reporting potential data race conditions. Often, multiple tools are used together to complement each other in order to produce actionable information for application developers. However, deploying these tools have many practical obstacles. Installing and configuring each tool on a variety of machines is tedious and error-prone. In addition, some tools require privileged access, which is hard to obtain on a managed cluster. Finally, combining results from multiple tools is even more challenging. There is currently no common APIs and exchangeable formats to facilitate the interoperability of the tools. These constraints make it painfully difficult for CDI developers to leverage available tools to improve their applications.

Proposed Solution: We have a vision in which any program analysis tools could be available 24×7 as cloud-based web service. Anyone could submit an application and rapidly obtain results merged from multiple tools, with minimal human interventions. Furthermore, we want to define a common reporting format to facilitate communication among tools. Similarly, tools should expose various APIs so users (including both developers and other tools) can freely leverage tools' functionality and query their internal status.

We can make this vision a reality by leveraging modern web application design technique. We should use micro-services to host interfaces within containerized environments to compile and analyze user's applications. The ROSE team at LLNL already has a prototype AWS-based internal web server exposing ROSE-based tools to internal users. The cloud-based access to tools is extremely convenient for us to quickly get results by using only a browser. We should create a collaborative service-oriented program analysis tool community to help different users:

1) **Tool developers**: they would write "recipes" to install and configure analysis tools in portable and scalable containers using dockers
2) **Application developers**: they would write "recipes" to build and run applications.
3) **Software analysts:** they can select multiple tool and application recipes to rapidly obtain and combine results to generate actionable info.

Such collaborations could lead to the creation a "marketplace" gathering available program analysis tools packaged as services. There are still many open challenges, including the cost of running cloud-based services, security of the servers, privacy of clients, and the complexity of application building/execution process.

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. LLNL-CONF-773239